CptS 260 Final Exam Study Guide

Fall, 2019

The final will be two hours long. Closed everything, except for a (non-internet-connected) calculator (a "programmer's model" is acceptable) and a copy of the "green card".

1. Introduction (Chapter 1)
2. Machine Instructions (Chapter 6)
   - instruction set architecture
   - registers
   - address ranges
   - assembler implementation of higher-level concepts (e.g. linked lists)
3. Computer Arithmetic (Chapters 1 and 5)
   - powers of two
   - signed and unsigned arithmetic
   - floating point computation
4. Digital Logic and Digital Systems (Chapters 1, 2, and 3)
   - Boolean logic circuits
   - latches
   - flip-flops
   - Karnaugh maps
   (midterm)
5. Processor Architecture (Chapters 5, 6, and 7)
   - architecture vs. microarchitecture
   - mapping instruction fields to control and data signals
   - processor stages
   - processor block diagrams
   - data and control flow for instructions
     - cycle time determination
   - single-cycle vs. multicycle vs. pipelined
   - multiplexers
   - decoders
   - pipelining
     - benefits
     - architectural demands made by pipelining
     - stall causes and avoidance
6. Memory System Organization and Architecture (Chapters 3, 5, and 8)
   - the memory hierarchy
     - typical access times
     - memory types
   - caching
     - address partitioning
     - cache mapping
       - direct
       - N-way associative
       - fully associative
   - spatial and temporal locality
   - hit/miss computation
   - cache miss types and strategies
     - compulsory
     - capacity
     - conflict

7. Interfacing and Communication (Chapter 8)
   - memory mapped I/O
     - address decoder
   - Amdahl's Law

8. Multiprocessing (Chapter 7)
   - need for parallel processing
   - parallelism
     - multiple-issue architectures
     - speculation
     - very long instruction words (VLIW)
       - scheduling left up to compiler
     - superscalar
       - hardware organizes parallel use
     - multicore
     - multithreading

9. Cybersecurity
   - TBD

10. Alternative Architectures
    - implementing alternative forms of logic
• RISC vs. CISC